Relationship Between Continuity of Care and Diabetes Control: Evidence From the Third National Health and Nutrition Examination Survey

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Objectives. We examined the relationship between continuity of care and diabetes control.

Methods. We analyzed data on 1400 adults with diabetes who took part in the Third National Health and Nutrition Examination Survey. We examined the relationship of continuity of care with glycemic, blood pressure, and lipid control.

Results. Continuity of care was associated with both acceptable and optimal levels of glycemic control. Continuity was not associated with blood pressure or lipid control. There was no difference between having a usual site but no usual provider and having a usual provider in any of the investigated outcomes.

Conclusions. Continuity of care is associated with better glycemic control among people with diabetes. Our results do not support a benefit of having a usual provider above having a usual site of care. (*Am J Public Health.* 2004;94:66–70)

Diabetes mellitus is a common and potentially disabling chronic disease.[1,2] People with diabetes are at increased risk for a number of complications, including retinopathy, renal disease, and heart disease. High-quality medical care has been shown to reduce these complications among patients with diabetes.[3] The American Diabetes Association (ADA) has recommended monitoring diabetes and its complications through the use of periodic tests as well as appropriate management once complications are identified.[4] However, recent data suggest that a gap exists between recommended diabetes care and the care patients actually receive.[5]

Continuity of care has been shown to have positive benefits, including increased likelihood of cancer screening,[6] better communication between patients with chronic disease and their physicians,[7] and increased patient adherence with follow-up appointments.[8] Provider continuity could have a positive impact on quality of care and outcomes because of the long-term relationship and concomitant accrued knowledge that develop between a patient and a provider.[9]

There is some disagreement regarding whether having a usual site of care but no usual provider is equivalent to having a usual provider. The United States Institute of Medicine and the British General Medical Services Committee have made little distinction between continuity with a team of providers and continuity with a regular provider.[10,11] However, having a usual site of care may not be equivalent to having a regular provider in terms of benefits. One study demonstrated that patients at high levels of continuity with a provider had a decreased likelihood of future hospitalizations relative to patients with a usual site but no usual provider.[12] In another study, a generally linear trend was found in breast and cervical cancer screening rates when moving from the presence of no usual source of care to the presence of a usual care site and the presence of a usual provider at that care site.[6]

Few studies have focused on the impact of continuity of care on diabetes control, and the limited data available have indicated mixed results.[13,14] One recent study conducted in 5 community health centers on the US–Mexico border among a primarily Hispanic population revealed that continuity with a provider was associated with better glycemic control.[15] However, this study assessed continuity only among providers at the clinic, thereby excluding visits made to providers outside the clinic. All patients were therefore assumed to have continuity with a site.

Thus, the difference between having a usual site of care and having a usual provider has not been studied in terms of its impact on diabetes control and related chronic conditions such as hypertension and hyperlipidemia. As a result, the objective of this study was to examine, in a national sample of adults with diabetes, the effect of continuity with a site versus continuity with an individual provider on control of diabetes and control of associated chronic conditions.

METHODS

The present study involved an analysis of data from the Third National Health and Nutrition Examination Survey (NHANES III). In this survey, information was collected on multistage, stratified, clustered samples derived from a civilian, noninstitutionalized population. The National Center for Health Statistics administered the survey to a randomly selected group of approximately 40 000 residents in 89 communities across the United States.

The survey was conducted in 2 phases. The first phase was administered in 44 different locations between October 1988 and October 1991. The second phase took place from September 1991 to October 1994 in 45 different locations. Eighty-six percent (33 994) of surveyed residents were interviewed in their homes. All surveyed residents were invited to examination centers for additional data collection, including physical examination and laboratory measures. Seventy-nine percent (31 311) of those surveyed completed all or some of the physical examination and laboratory data collection.

The NHANES III household adult data file contains the results of the questionnaire administered to all adults (defined as noninstitu-

tionalized civilians 17 years or older) in the survey population just described. During the 6 years of NHANES III data collection, 20 500 adults completed the household survey. Interviews were conducted in English and Spanish by highly trained field staff. These staff were continuously retrained throughout the 6-year period to ensure that the appropriate standard was maintained.

The NHANES III examination and laboratory data files contain the results of the examinations and laboratory tests performed on survey participants who followed up their household interview as requested with a visit to one of the NHANES mobile examination centers. Survey participants were examined within a month of completing their household interview. A less comprehensive home examination was available to participants who were unable to leave their home.

The present study focused on adults with diabetes. We operationalized the presence of diabetes as an affirmative answer to the question "Have you ever been told by a doctor that you have diabetes or sugar diabetes?" Among individuals with self-reported diabetes, we excluded those whose diabetes was limited to the gestational form. NHANES III did not contain a follow-up question to differentiate, among individuals who had been told that they had diabetes, those diagnosed with type 1 or type 2. After merging 3 data files containing the variables needed for the study, complete data were available from 1400 individuals.

Independent Variable

Continuity of care was based on answers to the following questions. Individuals were asked "Is there a particular clinic, health center, doctor's office, or other place that you usually go to if you are sick, need advice about your health, or for routine care?" If they answered yes, they were asked "Is there one particular doctor or health professional you usually see?" This information allowed us to create an ordered continuity variable consisting of 3 categories: (1) no usual source of care, (2) usual site but no usual provider, and (3) usual site and provider.

Dependent Variables

We focused on measures of diabetes control and several associated comorbidities.

Glycemic control. We used measured glycated hemoglobin (HbA1c) results as indicators of glycemic control. We examined the proportions of individuals with HbA1c levels of 7% or below (representing optimal control) and the proportions with HbA1c levels of 8% or below (representing acceptable control). These standards are consistent with the recommendations of ADA both at the time of data collection and currently.[4,16]

Blood pressure control. This value represented the mean of 3 measurements of systolic and diastolic blood pressure. In terms of systolic blood pressure, we considered values of 130 mm Hg or below as indicating optimal control and values of 140 mm Hg or below as indicating acceptable control. In regard to diastolic blood pressure, we classified levels of 85 mm Hg or below as representing optimal control and levels of 90 mm Hg or below as representing acceptable control. Again, these standards are consistent with the recommendations of the ADA at the time of data collection as well as currently.[4,16]

Lipid control. We measured low-density lipoprotein (LDL) levels as a means of assessing lipid control. We defined optimal LDL control as levels below 100 mg/dL, and we defined acceptable control as levels below 130 mg/dL. The latter level of control is consistent with the 1993 guidelines of the National Cholesterol Education Program and with the current ADA guidelines.[4,17]

Confounding Variables

We controlled for other variables that could affect screening for and presence of diabetes comorbidities, including length of time with diabetes, age, general health status, gender, race, income, education, health insurance coverage, and health care use in the previous 12 months.

Data Analysis

We weighted data and conducted analyses using SUDAAN in an effort to account for the complex survey design in our parameter and standard error estimates. We conducted bivariate analyses using χ^2 tests that focused on continuity of care and control of diabetes and associated comorbidities. In an effort to control for potential confounding variables in our cross-sectional data set, we computed multiple logistic regressions in which continuity was entered as a series of dummy variables. These regressions took the form of forced inclusion models to allow for an examination of the independent relationship of continuity with diabetes control while controlling for the relevant confounding variables just described. In an effort to determine whether there were differences between having a usual site of care and having a usual provider in terms of control, we computed additional regressions in which the reference category was presence of a usual site of care.

RESULTS

The percentage of adult patients with diabetes and no usual source of care was 5.2%. The percentage with a usual care site but no usual provider was 9.3%, and the percentage with a usual site and provider was 85.5%. Table 1 shows the characteristics of the population stratified according to continuity of care. Hypertension and hyperlipidemia were common comorbid conditions in this population of patients with diabetes, with 52.3% indicating that they had been told by a doctor they had high blood pressure and 44.0% indicating that they had been told they had high cholesterol.

Tables 2 and 3 show the associations between continuity and the diabetes control measures. In the bivariate analysis, continuity appeared to be associated with control of systolic blood pressure but not with control of diastolic blood pressure, HbA1c, or LDL cholesterol. When control variables were added to the analysis, the results changed somewhat. In the multivariate analysis, having a usual provider and a usual site, as well as having a usual site but no usual provider, was associated with a higher likelihood of optimal glycemic control than having no usual source of care.

In adjusted analyses, continuity was not associated with blood pressure or lipid control. The impact of having a usual provider (odds ratio [OR]=6.69; 95% confidence interval [CI] =2.61, 17.18) was no greater than the impact of having a usual site but no usual provider (OR=11.81; 95% CI=4.02, 34.71). The results were similar when we used a more lenient standard of glycemic control. In

TABLE 1—Characteristics of Patients With Diabetes, by Level of Continuity (n = 1400)

	No Usual Source, %	Usual Site/No Usual Provider, %	Usual Provider, %	*P*
Age, y				.01
17–35	18.4	18.1	7.2	
36–50	41.7	24.5	18.8	
51–65	27.2	31.3	34.4	
≥ 66	12.7	26.1	39.6	
Years with diabetes				.16
0–5	61.3	49.9	43.1	
6–10	13.1	19.7	20.2	
11–15	10.5	6.2	16.4	
≥ 16	15.1	24.3	20.3	
Gender				.40
Male	33.0	40.0	43.5	
Female	67.0	60.0	56.5	
Race/ethnicity				<.01
Non-Hispanic White	55.1	65.6	75.8	
Non-Hispanic Black	18.3	16.9	13.8	
Mexican American	14.9	11.3	5.0	
Other	11.7	6.2	5.4	
Insurance coverage				.13
Yes	73.5	93.3	93.9	
No	26.5	6.7	6.1	
Education				<.01
Less than high school	49.8	43.5	42.4	
High school	21.7	36.6	32.4	
Some college	16.4	12.1	14.6	
College	3.6	7.8	5.8	
Postgraduate	8.5	0.0	4.8	
Income per year, $				.12
< 20 000	55.7	61.2	44.3	
≥ 20 000	44.3	38.8	55.7	
Health status				.94
Excellent	5.0	9.3	5.1	
Very good	18.0	17.5	17.0	
Good	39.2	38.4	35.4	
Fair	27.8	21.3	29.7	
Poor	10.0	13.5	12.8	

Note. All analyses are weighted to account for the complex survey design.

comparison with patients with no regular source of care, those with a regular provider (OR=4.62, 95% CI=2.02, 10.60) and those with a regular site but no regular provider (OR=6.13; 95% CI=2.08, 18.04) were more likely to have an HbA1c level below 8%.

In terms of a potential dose–response effect, multivariate analyses indicated that there was no significant difference between having a usual provider and having a usual site of care but no usual provider in the case of any of the diabetes control outcomes assessed (glycemic control, blood pressure, and LDL). In comparison with individuals with a usual provider, those with a usual site of care but no provider had an odds ratio of acceptable glycemic control of 1.76 (95% CI=0.97, 3.20). The odds ratio for optimal glycemic control was 1.33 (95% CI=0.74, 2.39) among patients who had a usual site of care but no usual provider relative to patients who had a usual provider.

DISCUSSION

In this investigation of the relationship between continuity of site or provider and intermediate patient outcomes in terms of blood pressure, lipid, and glycemic control, our analyses (adjusting for other variables) indicated an association between continuity and glycemic control. People with diabetes who had either continuity of site or continuity of provider were more likely than those without a regular site or provider to have acceptable glycemic control. However, there was no association between continuity and the other intermediate outcomes (systolic and diastolic blood pressure and LDL cholesterol). Moreover, there was no significant difference between having a usual provider and having a usual site of care but no usual provider.

The finding of a relationship between continuity and glycemic control among patients with diabetes indicates that having a usual source of care does make a difference and that fragmentation of care leads to poor health outcomes. Having either a specific provider or a usual site of care without a specific provider yields better glycemic control than not having a usual source of care. This result supports the concept that continuity of care—whether in regard to a site or a specific individual—is beneficial. It contrasts with previous evidence indicating that, in terms of likelihood of hospitalization, continuity with place but not provider is not as beneficial as continuity with a specific provider, but it seems to be consistent with the Institute of Medicine's more expansive conception of continuity of care.[10,12]

It could be that simply having access to care is sufficient to yield better outcomes in terms of management of chronic diseases. Even if patients value continuity with a provider, the benefits of a longitudinal patient–physician relationship may be more evident in interpersonal outcomes than disease control.[7]

Glycemic control was the only control measure found to be related to continuity in the present population of patients with diabetes. This result may reflect the fact that providers

TABLE 2—Control of Diabetes and Complications, by Level of Continuity

	No Usual Source, %	Usual Site/No Usual Provider, %	Usual Provider, %	*P*
Glycemic control				
HbA1c ≤ 7%	34.3	61.0	46.4	.08
HbA1c ≤ 8%	44.2	67.1	61.5	.19
Systolic blood pressure				
≤ 130 mm Hg	60.7	62.3	43.7	.01
≤ 140 mm Hg	83.5	75.5	66.9	.02
Diastolic blood pressure				
≤ 85 mm Hg	82.3	93.2	88.5	.25
≤ 90 mm Hg	97.8	97.0	95.5	.23
Lipids				
≤ 100 mg/dL	78.7	76.1	74.6	.80
≤ 130 mg/dL	85.8	89.2	85.7	.67

TABLE 3—Control of Diabetes and Comorbid Conditions, by Level of Continuity, Adjusted Models

	Odds Ratio	95% Confidence Interval
Glycemic control		
HbA1c ≤ 7%		
No usual source	1.00	
Usual site	11.81	4.02, 34.71
Usual provider	6.69	2.61, 17.18
HbA1c ≤ 8%		
No usual source	1.00	
Usual site	6.13	2.08, 18.04
Usual provider	4.62	2.02, 10.60
Blood pressure		
Systolic ≤ 130 mm Hg		
No usual source	1.00	
Usual site	2.76	0.70, 10.93
Usual provider	1.78	0.55, 5.72
Systolic ≤ 140 mm Hg		
No usual source	1.00	
Usual site	1.02	0.28, 3.78
Usual provider	0.87	0.36, 2.13
Diastolic ≤ 85 mm Hg		
No usual source	1.00	
Usual site	3.64	0.55, 24.17
Usual provider	1.41	0.26, 7.61
Diastolic ≤ 90 mm Hg		
No usual source	1.00	
Usual site	0.65	0.11, 3.79
Usual provider	0.46	0.12, 1.76
Lipids		
≤ 100 mg/dL		
No usual source	1.00	
Usual site	1.93	0.71, 5.24
Usual provider	1.10	0.44, 2.73
≤ 130 mg/dL		
No usual source	1.00	
Usual site	2.37	0.82, 6.79
Usual provider	1.59	0.55, 4.57

Note. The following variables were controlled for in analyses: age, race, gender, education, insurance coverage, health status, income, length of time with diabetes, and number of times seeing a health professional in the past 12 months.

treating patients with diabetes are emphasizing glycemic control; they may view control of lipids and control of blood pressure as important but secondary priorities. In a study conducted in the mid-1990s among managed care patients with non-insulin-dependent diabetes, the rate of adherence to several guidelines for care was less than 50%, indicating that physicians may not place as high a value on these prevention measures as would be hoped.[18] Recent examinations of screening for nephropathy, another affiliated complication of diabetes recommended for screening, have shown that most patients with diabetes are not receiving screening at the recommended rates.[19]

Our study was based on a large representative sample of the community-dwelling US population and should be generally representative of adults with diabetes in the United States. However, a number of qualifications should be noted. The data we gathered on whether patients had been told by a doctor that they had diabetes were self-reported. In addition, we were unable to distinguish between type 1 and type 2 diabetes, although all of the measured outcomes are important for individuals with both types of diabetes. Continuity levels were defined in relatively general terms, and we did not have information on proportions of health care visits made to the same site or provider.

Furthermore, the NHANES surveys were undertaken several years ago, and expert opinion regarding routine diabetes care has changed, although current levels in regard to optimal and acceptable laboratory values are consistent with 1994 recommendations.[16] Also, the present data were cross sectional, and thus differences in outcomes and continuity may simply have reflected a selection bias. An additional limitation of the cross-sectional nature of the data is that we cannot be certain of any causality in the relationship between continuity and glycemic control.

Nevertheless, despite these qualifications, continuity was found to be associated with glycemic control in this population of adults with diabetes. A potential explanation for this result is that repeated visits to the same provider increase patients' opportunities for appropriate diabetes care and education. A second explanation is that people with diabetes who seek continuity also actively prompt their clinician to provide appropriate care. A third potential explanation is that patients who visit a provider they judge to offer quality care will seek to return to the same provider. Our analysis adjusted for a large number of variables, but we are unable to judge which of these 3 explanations (or other explanations) accounted for the observed association.

Other aspects of health care services have been shown to be associated with the process and outcome of care for people with diabetes. For example, in a study of care for people with diabetes in general practices in the United Kingdom, process measures of care (blood pressure and HbA1c checks) were more likely to be administered to patients visiting smaller practices, and patients undergoing specialist services were less likely to have a normal glycated hemoglobin level.[20]

There is consistent evidence that most patients, most of the time, prefer continuity of

care. A growing number of studies are identifying associations between continuity and aspects of the process of care, yet in the United States and other developed countries, health systems are attempting to maximize efficiency at the expense of reduced continuity. Although experimental studies of the outcomes of continuity and discontinuity are difficult to undertake, they are urgently needed. ■

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Contributors

A.G. Mainous was responsible for study conception, data analysis and interpretation, and drafting the article. R.J. Koopman, J.M. Gill, and R. Baker contributed to study conception, data analysis and interpretation, and revisions of the article. W.S. Pearson contributed to the data analysis.

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Human Participant Protection

No protocol approval was needed for this study.

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